

Claims

What is claimed is:

1 1. A method of illumination in a biochip reader comprising the
2 steps of:
3 providing an illumination source;
4 providing a glass substrate having opposing sides and said glass
5 substrate carrying a bioarray;
6 directing light from said illumination source to opposing sides of said
7 glass substrate by a pair of optical fiber bundles; each of said optical fiber
8 bundles including a plurality of optical fibers;
9 forming an optical fiber fan of each of said optical fiber bundles, each
10 said optical fiber defining a line of optical fiber faces of said plurality of
11 optical fibers; and
12 providing a respective divergent diffuser proximate to each line of
13 optical fiber faces for coupling and diffusing light substantially evenly through
14 said opposing sides of said glass substrate to illuminate said bioarray carried
15 by said glass substrate.

1 2. A method of illumination in a biochip reader as recited in claim
2 1 wherein the step of forming said optical fiber fan of each of said optical
3 fiber bundles, each said optical fiber fan defining said line of optical fiber
4 faces of said plurality of optical fibers includes the steps of forming said
5 optical fiber fan being one fiber thick and defining said line of optical fiber
6 faces of said plurality of optical fibers.

1 3. A method of illumination in a biochip reader as recited in claim
2 1 wherein the step of directing said light to opposing sides of said glass
3 substrate by said pair of optical fiber bundles further includes the steps of
4 providing a second pair of optical fiber bundles; and directing said light to
5 opposing ends of said glass substrate.

1 4. A method of illumination in a biochip reader as recited in claim
2 1 wherein the step of providing a respective divergent diffuser proximate to
3 each line of optical fiber faces for coupling and diffusing light substantially
4 evenly through said opposing sides of said glass substrate to illuminate said
5 bioarray supported by said glass substrate includes the steps of providing
6 said respective divergent diffuser formed of a silicon material.

1 5. A method of illumination in a biochip reader as recited in claim
2 1 wherein the step of providing a respective divergent diffuser proximate to
3 each line of optical fiber faces for coupling and diffusing light substantially
4 evenly through said opposing sides of said glass substrate to illuminate said
5 bioarray supported by said glass substrate includes the steps providing said
6 glass substrate used as a secondary laser light guide.

1 6. A method of illumination in a biochip reader as recited in claim
2 1 wherein the step of providing a respective divergent diffuser proximate to
3 each line of optical fiber faces for coupling and diffusing laser light
4 substantially evenly through said opposing sides of said glass substrate to
5 illuminate said bioarray supported by said glass substrate includes the steps
6 using each optical fiber face for light transfer at a restricted angle.

1 7. A method of illumination in a biochip reader as recited in claim
2 1 wherein said step of using each optical fiber face for laser light transfer at
3 a restricted angle in a range between 55° to 60°.

1 8. A method of illumination in a biochip reader as recited in claim
2 1 wherein said step of forming said optical fiber fan of each of said optical
3 fiber bundles, each said optical fiber fan defining said line of optical fiber
4 faces of said plurality of optical fibers includes the steps of forming said
5 optical fiber fan of each of said optical fiber bundles on a positioner; said
6 positioner positioning said glass substrate carrying said bioarray.

1 9. A method of illumination in a biochip reader as recited in claim
2 1 wherein said step of providing a glass substrate having opposing sides
3 and said glass substrate carrying a bioarray includes the steps of providing a
4 glass holder for supporting said glass substrate carrying said bioarray; said
5 glass holder including a plastics springs member in spring contact
6 engagement with said glass substrate for positioning said bioarray in a focal
7 plane.

1 10. Apparatus for bioarray illumination in a biochip reader
2 comprising:
3 an illumination source;
4 a glass substrate having opposing sides and said glass substrate
5 carrying a bioarray;
6 a pair of optical fiber bundles directing said light from said illumination
7 source to opposing sides of said glass substrate; each of said optical fiber
8 bundles including a plurality of optical fibers;
9 a pair of optical fiber fans formed by said optical fiber bundles
10 proximate to opposing sides of said glass substrate carrying said bioarray,
11 each said optical fiber fan defining a line of optical fiber faces of said plurality
12 of optical fibers; and
13 a respective divergent diffuser proximate to each said line of optical
14 fiber faces for coupling and diffusing laser light substantially evenly through
15 said opposing sides of said glass substrate to illuminate said bioarray carried
16 by said glass substrate.

1 11. Apparatus for bioarray illumination as recited in claim 10
2 wherein said glass substrate functions as a secondary laser light guide.

1 12. Apparatus for bioarray illumination as recited in claim 10
2 wherein each said optical fiber fan is one fiber thick.

1 13. Apparatus for bioarray illumination as recited in claim 10
2 wherein each said divergent diffuser is formed of a silicon material.

1 14. Apparatus for bioarray illumination as recited in claim 10
2 wherein said illumination source includes one of a low power non-collimated
3 laser diode or a light emitting diode (LED).

1 15. Apparatus for bioarray illumination as recited in claim 14
2 wherein said low power non-collimated laser diode has a power rating in a
3 range between 3 mW through 5 mW.

1 16. Apparatus for bioarray illumination as recited in claim 9
2 wherein said illumination source includes a plurality of light sources; one
3 respective light source of said plurality of light sources coupled to each
4 optical fiber bundle.

1 17. Apparatus for bioarray illumination as recited in claim 9
2 wherein said non-collimated laser source providing laser light includes a
3 non-collimated laser source providing laser light at a set wavelength in a
4 range between 470 nm and 650 nm.

1 18. Apparatus for bioarray illumination as recited in claim 9
2 includes a reflector positioned proximate to another side of said glass
3 substrate spaced apart from said fiber optic fans; said reflector for reflecting
4 outgoing light back into said glass substrate.

1 19. A biochip reader comprising:
2 an illumination source,
3 a glass substrate carrying a bioarray;
4 an optical fiber bundle directing said light from said illumination source
5 to one side of said glass substrate; said optical fiber bundle including a
6 plurality of optical fibers;
7 an optical system;
8 a glass holder supporting and aligning said glass substrate carrying
9 the bioarray with said optical system, and
10 said glass holder including a plastic springs member in contact
11 engagement with said glass substrate with low contact forces for positioning
12 said bioarray in a focal plane of said optical system.

1 20. A biochip reader as recited in claim 19 includes a positioner
2 coupled to said glass holder for positioning said bioarray within a field of
3 view of said optical system.

1 21. A biochip reader as recited in claim 19 includes an optical fiber
2 fan formed by said optical fiber bundle proximate to a side of said glass
3 substrate carrying said bioarray, said optical fiber fan defining a line of
4 optical fiber faces of said plurality of optical fibers.

1 22. A biochip reader as recited in claim 21 includes a divergent
2 diffuser separating said optical fiber faces from an edge of said glass
3 substrate, said divergent diffuser protecting said optical fibers from
4 mechanical damage.

1 23. A biochip reader as recited in claim 19 wherein said plastic
2 springs member is formed of a Velcro material.

1 24. A biochip reader as recited in claim 19 includes a reflector
2 positioned proximate to another side of said glass substrate spaced apart
3 from said fiber optic fan; said reflector for reflecting outgoing light back into
4 said glass substrate.